Br. Viswanath

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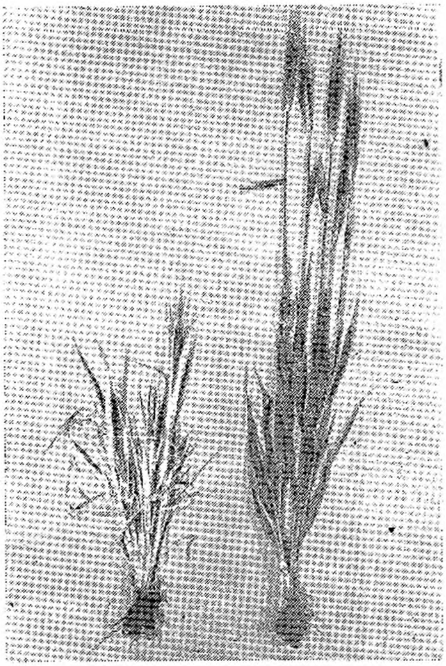

Rice Root Aphid infested and healthy barley plants (Please refer to the article on page 53).

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Appreciations

.........Will be of considerable help to our extension officers to keep themselves in touch with the latest developments in crop pest control in India.........

C. Srinivasan
Principal,
Plant Protection Training Centre,
Hyderabad

............These newsletters are really very informative and will be of great use to the extension workers. I shall be grateful if you kindly keep us on your regular mailing list.

I. N. Tandon
Deputy Director,
Plant Protection,
Uttar Pradesh (Lucknow)

............I find this is full of the most recent and very useful information. I am sure this would prove to be of great value both to students and research workers.

I would very much like to be on your mailing list.

S. P. Capoor
Virus Pathologist,
Regional Research Station (I.A.R.I.),
Poona-5

Bioassay and its Role in Toxicological Investigations

The comparison of the efficacy of insecticides against various pests is attracting more and more attention from the entomological workers in the country, as it is becoming more and more essential in view of the rapid influx of insecticidal chemicals in the market. A number of these comparisons are found to be not as accurate as they can be in case proper bioassay technique is adequately made use of. Hence the following important points may be of use, particularly to young workers in the field of Entomology.

Bioassay may be defined as the measurement of the potency of any stimulus, i.e., physical, chemical, biological, physiological, psychological, etc., by means of the reactions which it produces in a living organisum. In toxicological investigations, considering the insecticide as a principal source of stimulus and keeping the other stimuli as constant as possible, the effect produced in an insect by it may be measured by what is generally referred to as "*all or none response*" i.e., either the insect is taken as dead or alive ; the moribund insects are usually considered as dead. This kind of response has also been referred to as quantal response. Finney, D. J. (Probit Analysis, 1964) has thoroughly discussed the subject and given a statistical treatment in great detail.

Sigmoid relationship of log-dosage and per cent mortality : Due to the variation in sensitivity within a population, the effect of a stimulus results in a normal distribution of log. tolerances. Taking logarithm of dosage as abscissa and per cent mortality as ordinate, the dosage response curve is an elogated S-shaped curve (sigmoid). Logarithm of the dosage is taken because the change in magnitude or intensity of a biological response is proportional not to the change in the stimulus but to its logarithm.

Straight-line relationship of log-dosage and probit kill : It is difficult to use a sigmoid curve for interpolation, i.e., to find mortalities at intermediate dosages. Improvement is made by expressing the spread in susceptibility within a population in terms of the standard deviation in a normal curve. The *effect* is expressed *not in percentages* of the population affected by the dosages *but in terms of standard deviations* from the mean. The crowding of individuals about

the mean value is exactly balanced by the crowding of percentages about the dosage with zero standard deviation. As the standard deviations may be positive or negative, it is convenient to increase all these values by a number which will give positive values. The units of standard deviations plus 5 are called probits. The probit of proportion 'P' is defined as the abscissa which corresponds to a probability 'P' in a normal distribution with mean 5 and variance 1. In symbols the probit of P is Y ; and if these probits are plotted against log-dosages (x), a straight line is obtained which is called the log-dosage-probit line (LD-P line).

Significance of LD-P Line : Rate of change of effect in relation to a unit change in dosage is expressed by the slope of the line which thus expresses the variability in susceptibility of the test population. A steep line means a population having small variation in susceptibility, whereas a flat line indicates a population varying widely in susceptibility.

Sensitivity of the population to the stimulus at mid-way of the line, i.e., at probit 5 where it is crowded, is highest. In other words for a unit increase in dosage there is a greater increase in kill at LD50/LC50 than at other levels above or below this point. The precision of the estimate is also high for this point. That is why lethal dosage/concentration giving 50% kill is the most sensitive point and used for comparison of toxicity of pesticides.

The median lethal dosage of an insecticide is a quantitative expression of the tolerance of a particular species (or strain) of insects under certain conditions. The same data provide a measure of the toxicity of the insecticide used. The higher the median lethal dosage, the lower will be the toxicity of the insecticide. Insecticides are often compared by potencies, which are inversely related to the dosage ; and comparison is usually done by the ratio, equating one of the potencies to one unit.

Experimental procedure : A simplified version (Busvine, J. R. (A critical Review of the techniques for testing insecticides, pp 170-72 1957), coupled with the practice followed here is given below.

Batches of insects are exposed to dosages of an insecticide. The insects to be tested should be free from variations due to age, stage, sex, condition of nutrition, etc. There is generally little advantage in exceeding 30 to 50 individuals per batch unless the test conditions are very erratic. With precise experimental conditions, batches as

small as 10 to 20 individuals may be used and it is desirable to replicate the batches 3 to 5 times. The batches of insects should be so formed as to ensure that each batch is a random sample of the population. The dosages for testing should be spaced as evenly as possible over the mortality range, and since the toxic effect is related to logarithm of the dosage, rather than the dosage itself, the selected dosages should be in a geometric series such as 1, 2, 4, 8 or 1, 3, 9, 27, etc. After the insects are exposed to the different concentrations of an insecticide, they are kept in clean containers with food, and mortality count is taken after an interval of time already fixed by a preliminary experiment, where the mortality has been recorded at various intervals and the time when it becomes constant should be fixed as the time for taking observations.

Often a few insects die during an experiment from natural causes or from causes unconnected with the insecticide used. The magnitude of this mortality is estimated from the 'control' batch of insects which are treated in exactly the same way as the test insects, except for the exposure to the insecticide. This 'control mortality', if it is appreciable, will affect the precision of the results ; and a correction is usually applied by using the formula by Abbott, W. S. (*J. econ. Ent.*, **18** : 265-7, 1925) as follows :—

$$P = \frac{P_1 - C}{100 - C}$$

Where P = the corrected per cent mortality ;
P_1 = the observed per cent mortality ;
C = the per cent control mortality.

Utility of bioassay in Toxicological investigations :

Screening of chemicals for their value as insecticides : Bioassay is adopted for screening out chemicals of potential insecticidal value from amongst those of unknown activity. It also helps to find out the property of synergism or antagonism of a compound when used in a mixture with an insecticide.

Relative toxicity of insecticides : The value of relative toxicity determined by bioassay along with the availability and market price, should be the index for selecting promising insecticides for large scale field trials against an insect pest. The method can be extended to evaluate the insecticides for their safety to pollinators as

well as parasites and predators of insect pests ; and these results are useful in integrated control of insect pests.

Quality control of formulated insecticide : Bioassay can help the formulators in improving the effectiveness of the products. Facility for testing formulated insecticides exists since 1955 in this Division at Rs. 50/- per sample per test.

The quality of marketed insecticides and their formulations can be checked by taking samples at consumers' level and testing their biological activity in laboratory.

Insecticide resistance in insects · The changes in values of LD50/LC50 of an insecticide for an insect pest with the passage of time indicate variation in its susceptibility which helps in the detection of resistance when developed in its population.

Bioassay further helps to investigate connected problems such as cross-resistance to other insecticides, inheritance of resistance, use of synergists and mixed formulations to overcome resistance, factors influencing the toxicity of insecticides and estimation of insecticide residues on crops at harvest time to safeguard consumers from toxic hazards.

Rattan Lal & P. N. Saxena*

Nomenclatural Changes of Lac Insects

Balachowsky (1950) has transferred the oriental species of genus *Tachardina* to his new genus, *Paratachardina*, restricting *Tachardina* sensu str. to ethiopian material only.

All the species hitherto referred under *Laccifer*, *Tachardia* or *Lakshadia*, should be cited under genus *Kerria*.**

Thus, all the Indian species included in the Catalogue of Lac insects (Kapur, 1958) need nomenclatural changes.

R. K. Varshney***

*Statistician, Indian Agricultural Research Institute, New Delhi-12.

***Indian J.-Ent.* **28** (i) : 116—118

***Deptt. of Zoology, Patna University, Patna.

Precautions against possible Locust outbreak

The conditions for another locust cycle are becoming more and more congenial. After several years of severe drought which is expected to have resulted in severe mortality of the desert fauna including the predators of locust, the locust breeding areas are receiving rain-fall. Hence the conditions for locust breeding are becoming ideal. There was slight rainfall last year resulting in slight locust breeding. This year the rainfall is somewhat more and there is increased locust breeding. Hence, it is not unlikely that there may be locust swarms later this year or during early summer next year unless the control measures in breeding areas are effectively adequate.

While the Governmental agencies will be preparing for locust destruction both in the breeding and the invasion areas, it is advisable that farmers in the invasion areas may seize the present opportunity for collecting *Neem seed* from their locality, dry and store the same for protecting their individual crops in the event of locust invasion Two to three Kg of dried neem seed may be needed per hectare.

S. Pradhan

Resistance to the Pink Bollworm, *Pectionphora gossypiella* Saunders in Cotton

Investigations on the basis of resistance to pink bollworm conducted at Delhi during the last two years have revealed that 6 varieties namely, Pusa selections, 5, 8, 9, 10, 14 and 15 manifested significantly less damage in opened bolls by this pest compared to the variety H 14, which is largely cultivated in the Northern Zone Amongst these selections, number 9 and 10 showed significantly higher yields i.e. of 1588.3 and 1712.6 Kg/ha whereas the yield of H 14 was 873.5 Kg/ha The latter is the normal yield for H 14 under Delhi conditions. It was noted that during the first picking itself i.e. on 25.9.70 the yields in PS 9 and 10 were double and by the third picking i.e. by 3.11.70, the yield in these varieties were more than 3 times of the standard variety H 14. However, at the end of the cotton season i.e., in November the differences in the incidence values on green boll basis were non-significant in PS 9 and PS 10 and H 14. Evidently the recent Pusa selections are inherently as susceptible as the standard variety H 14, but due to their early opening of the bolls, they escaped from the pink bollworm attack in the beginning of the crop maturity periods. It was thus established that due to the early maturity of

these varieties they escaped from the pink bollworm damage. These varieties due to their high yielding potential and the character of escaping from the most serious pest *viz.*, the pink bollworm hold a very great promise as prospective varieties for cultivation under North Indian conditions.

R.A. Agarwal, M. Singh, K.N. Katiyar & V.P. Singh

Heliothis spp. causing serious damage to sorghum

During Kharif 1970 trials on sorghum at Vallabhnagar (Udaipur), *Heliothis* spp. were observed causing serious damage to sorghum earheads. Apparently two species were involved, one of which has been identified as *Heliothis armigera* Huebner and the other is under identification. The population of the larvae varied from 5 to 8 per earhead. The caterpillars fed on tender grains leaving empty glumes on panicles. The damage was serious on both the high yielding variety Swarna and the hybrid CSH 1. No comparative study regarding the chemical control of this pest has been undertaken so far. However, the pest was effectively controlled by spraying the earheads with 0.05% endosulfan E.C. *Heliothis sp.* has been reported as a minor pest of sorghum from south India but no serious infestation has so far been reported from north and north western regions of the country. Data collected at Delhi have shown that the two species causing damage to earheads are *Eublemma silicula* Swinhoe and *Cryptoblabes gnidiella Miller*. *Heliothis* sp. has not so far been observed as a pest in Delhi.

Prem Kishore & M.G. Jotwani

Termites Attacking Bees-wax

Termites galleries were noted on bees-wax stored in the Division of Entomology I.A.R.I. during December, 1970. Specimens of termites recovered from these galleries have been found to belong to the genus *Coptotermes sp.* (Rhinotermitidae).

The authors have not so far come across any termite causing serious damage or even attacking bees-wax in storage.

M. G. R. Menon, D. S. Bisht & M. Naim

Non-insect Pests of Cotton

At Sirsa among the non-insect pests, *Pavo cristalis* and *Lepus spp.* cause a substantial damage to freshly sown cotton seeds and seedlings respectively.

D. K. Bhutani*

Rice Root Aphid observed on Barley at Delhi

During a survey of the barley crop at the Indian Agricultural Research Institute, New Delhi, an aphid was observed to infest the roots and the underground stems in a crop grown in a sandy loam area with high water table conditions. The aphid was identified as *Rhopalosiphum rufiabdominalis* (Sasaki), the Rice Root Aphid by Dr. M. G. Ramdas Menon of this Division and Miss Louise M. Russel of the U. S. Department of Agriculture, Washington, D. C. The aphid colonies were present on the crop from first week of January to the end of February, 1971. The infested plants were stunted and became pale yellow towards the end of this period (see photograph on cover page). These symptoms are also typical of barley yellow dwarf. Further studies are, however needed to confirm positively the cause of the stunting and the role of this aphid in disease transmission if present.

W. R. Young, S. K. Bhatia & K. G. Phadke

Single Application of Aldicarb Prevents Aphid Damage to Mustard

Studies conducted at I.A.R I., Regional Research Station, Kanpur during last eight years (1962-70) reveal that *Brassica compestris* var. *yellow sarson* (T-151) suffers an avoidable loss in seed yield ranging from 33 to 100 per cent during different seasons. Various spray treatments have been recommended against this pest but their frequent application is essential. Studies during last four years at Kanpur, have shown that only one application of aldicarb granules in soil @ 2 kg/ha during middle of December, just before the onset of

*Regional Research Station, (I.A.R.I.) Sirsa (Haryana).

aphid attack, protects the crop from aphids throughout the season. An increase of 124% in seed yield of *yellow sarson* (T.151) was obtained with this treatment over untreated check, taking three years mean seed yield into account This treatment is safe for beneficial insects, controls leaf miner, *Phytomyza atricornis* Meigen, and is easy in application as no machine is required and a perforated tin container can be used. However, this cannot be recommended as residue hazards involved in it have not been studied.

V. S. Singh,* J. P. Kulshreshtra** and C. A. R. Dias*

New Appointments

Dr. Prakash Swarup, Junior Entomologist joined as Entomologist (Maize) on 22.5.71

Smt. Meera Gupta, Research Assistant joined as Senior Research Assistant on 10.6.71.

Sh. Y. N. Srivastava, Research Assistant joined as Senior Research Assistant on 15.6.71.

Sh. K. L. Doharey, Research Assistant (Teaching) joined as Senior Research Assistant on 15.6.71.

Book Published

Lac Literature—A Bibliography of Lac insects & Shellac, by R. K. Varshney (1970), vi + 216 pp. Published by the Shellac Export Promotion Council, 14/1 B, Ezra Street, Calcutta-1. Unpriced and available on request from the publisher.

Editors

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**C.R.R I. Cuttack-6.

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